
Name of Organization: USFWS

Type of Organization: Federal Agency

Contact Information: Dr. Kofi Fynn-Aikins

Lower Great Lake Fishery Resource Office

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Project Title: Genetic\Morphological Monitoring of Dreissena spp.

Project Category: Exotic Species

Rank by Organization (if applicable): 0

Total Funding Requested (\$): 39,500 **Project Duration:** 1.5 Years

Abstract:

Since 1993 SUNY at Buffalo and the USFWS/LGLFRO have been collecting tissue samples from approximately 21 sites along the Erie Barge Canal. The proposed project will monitor temporal and spatial genetic and morphological variation in zebra and quagga mussels along the Erie Barge Canal from Buffalo to Syracuse, New York. Genetic diversity will be determined in each zebra and quagga mussel using established microsatellite DNA markers (i.e. genetic markers recently available to the public). Morphological variation will be determined by size-frequency distributions (both length and biomass). Specimens were and will be collected through ice in February (when there is no growth) and in August (when there is active mussel growth). The project has direct relevance to control and monitoring programs of several Great Lakes Basin states and provinces (New York State, Pennsylvania, Ohio, and Ontario, Canada). The study also addresses Lakewide Management Plans (LaMPs) needs and priority items identified in Lakes Ontario and Erie; (1) facilitating cooperative lakewide monitoring, and (2) invasive species. The Erie Canal is also an area of concern because impairment exists due to invasive bivalve mollusks, i.e., zebra and quagga mussels. This project will be the first step towards establishing a successful monitoring/control program for zebra and quagga mussels.

Geographic Areas Affected by the Project

States:

<input type="checkbox"/>	Illinois	<input checked="" type="checkbox"/>	New York
<input type="checkbox"/>	Indiana	<input checked="" type="checkbox"/>	Pennsylvania
<input type="checkbox"/>	Michigan	<input type="checkbox"/>	Wisconsin
<input type="checkbox"/>	Minnesota	<input checked="" type="checkbox"/>	Ohio

Lakes:

<input type="checkbox"/>	Superior	<input checked="" type="checkbox"/>	Erie
<input type="checkbox"/>	Huron	<input checked="" type="checkbox"/>	Ontario
<input type="checkbox"/>	Michigan	<input type="checkbox"/>	All Lakes

Geographic Initiatives:

<input type="checkbox"/>	Greater Chicago	<input type="checkbox"/>	NE Ohio	<input type="checkbox"/>	NW Indiana	<input type="checkbox"/>	SE Michigan	<input type="checkbox"/>	Lake St. Clair
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Primary Affected Area of Concern: Not Applicable

Other Affected Areas of Concern:

For Habitat Projects Only:

Primary Affected Biodiversity Investment Area: Not Applicable

Other Affected Biodiversity Investment Areas:

Problem Statement:

In North America, much research has been conducted on the ecology and physiology of 2 nonindigenous bivalve species, the zebra mussel (*Dreissena polymorpha*) and the quagga mussel (*D. bugensis*). However, there is currently no applicable genetic information to support monitoring programs of dreissenids within the Great Lakes Basin. The high levels of genetic and morphological variability identified in zebra and quagga mussels suggest that genotypes/morphotypes may vary in their ecological tolerances and response to methods of control. Thus a comparison of both the genetic and morphological variation should provide insights as to how such variability affects the ability of *Dreissena* spp. to colonize new habitats.

Proposed Work Outcome:

An ideal place to examine the genetic and morphological variation of dreissenids is from a long channel or canal. We will be analyzing dreissenids collected from 21 sites along roughly "half" the total length of the Erie Barge Canal in New York State. This section of the Canal is between Buffalo and Syracuse, NY. The area between Buffalo and Rochester is of particular interest because it is here that: (1) both dreissenid species are present, (2) any variation (if present) can be determined for both species, and (3) background data collected by one of us (K.M.Stewart) indicate that *D. bugensis* is gradually increasing its dominance at the expense of *D. polymorpha* in the more westerly portion. Another appealing feature is that the bulk of the inflowing water (in the Buffalo to Rochester section) is just from one source (Lake Erie). Our project will monitor the temporal and spatial genetic and morphological variation in dreissenids from 21 sites along the Canal. The project has direct relevance to control and monitoring programs of several Great Lakes Basin states and provinces (New York State, Pennsylvania, Ohio, and Ontario, Canada). The study also addresses Lakewide Management Plans (LaMPs) needs and priority items identified in Lakes Ontario and Erie; (1) facilitating cooperative lakewide monitoring, and (2) invasive species. The Erie Canal is also an area of concern because impairment exists due to invasive bivalve mollusks, i.e., zebra and quagga mussels.

The Erie Canal has a history of serving as a pathway for the introduction of non-indigenous species into watersheds of basins that were previously separated by natural geologic and hydrological barriers. With the construction of the Erie Barge Canal, in the first half of the 1800's, came the ability for organisms to migrate out of their restricted basins and into new and previously uncolonized areas. The first report of one species of zebra mussel (*D. polymorpha*) in the Great Lakes was in 1989. But that species, and perhaps the almost identical quagga species (*D. bugensis*) were likely introduced at least a couple years prior to 1989. The mussels spread rapidly and were in eastern Lake Erie and at least the western part of the Erie Canal by 1989-1990. Whereas the zebra mussel extended rapidly along the entire length of the Erie Canal, the quagga mussel appears to have dispersed more slowly and, to date, quaggas are prominent mainly in the western end of the Canal between Buffalo and Rochester. However, the quaggas are slowly expanding east down the Canal and there is

evidence that there has been a jump-dispersal of quaggas from the Buffalo-Rochester portion to some sites between Rochester and Syracuse.

The specific objectives of the project are to:

- (1) Monitor/determine the temporal and spatial genetic and morphological variation in zebra and quagga mussels at approximately 21 sites in the Erie Barge Canal between Buffalo and Syracuse.
- (2) Determine the genetic and morphological population structure of zebra and quagga mussels found in sympatry and allopatry.
- (3) Compare genetic/morphological data with other possible source populations (e.g. Lake St. Clair, Lake Erie, Lake Ontario) to determine the likely sources of annual ANS "innoculations".
- (4) Apply the genetic and morphological data to current monitoring/control programs throughout the Great Lakes.

Achieving these objectives will address important management questions and assist in current and future monitoring programs on these nuisance species throughout the Great Lakes Basin. This project will be the first step towards establishing a successful monitoring/control program for zebra and quagga mussels. Various groups (USFWS/LGLFRO, Buffalo State College, SUNY at Buffalo) have been involved in a variety of dreissenid investigations over the years. An important knowledge base to this specific proposed investigation is that some unpublished background studies, on size-frequency distributions of the Canal dreissenids have been carried out by one of us (KMS) back to 1993. Thus, we have samples from many of the same sites from 1993.

The USGS/Leetown Science Center will screen each zebra and quagga mussel sample to determine the genetic diversity using established microsatellite DNA markers (i.e. genetic markers recently available to the public). Morphological variation will be determined by size-frequency distributions (both length and biomass). Specimens were and will be collected through ice in February (when there is no growth) and in August (when there is active mussel growth).

Project Milestones:	Dates:
Project Start:	07/2000
Genetic & morphological data collection	08/2000
Continued zebra/quagga field collection	08/2000
Genetic & morphological data analysis	03/2001
Continued zebra/quagga field collection	08/2001
Report on results and recommendations	01/2002
	/
Project End	01/2002

Project Addresses Environmental Justice

If So, Description of How:

Project Addresses Education/Outreach

If So, Description of How:

Field Work: The USFWS/LGLFRO has a masters program student, interns, and volunteers assisting in the collection of zebra and quagga mussel specimens from the Erie Canal. In addition, an Erie Canal monitoring program has been established between the USFWS, the Cornell Cooperative Extension, and the Albion County (NY) 4-H. These participants will also be involved with sample collections.

Laboratory Analysis: The USGS/Leetown Science Center have student interns who will assist with the data collection.

Project Budget:

	Federal Share Requested (\$)	Applicant's Share (\$)
Personnel:	5,000	15,000
Fringe:	0	0
Travel:	3,000	1,000
Equipment:	10,000	3,000
Supplies:	19,000	0
Contracts:	0	0
Construction:	0	0
Other:	0	0
Total Direct Costs:	37,000	19,000
Indirect Costs:	2,500	0
Total:	39,500	19,000
Projected Income:	0	0

Funding by Other Organizations (Names, Amounts, Description of Commitments):

Dr. Kenton Stewart has volunteered his time at no cost. Dr. Stewart has spent approximately 500 hours collecting zebra and quagga mussel samples along the Erie Canal. Cost Estimate \$10,000.00

State University of New York at Buffalo
Department of Biological Sciences
Buffalo, New York 14260
(716)645-2898

Buffalo State graduate student, Mike Sowinski has assisted in the tissue sample collection of zebra and quagga mussels. Cost Estimate \$1200.00
University of College at Buffalo
1300 Elmwood Ave
Buffalo, New York 14222
(716 838-4329

Dr. Tim King is donating his time for the data analysis. Cost Estimate \$6000.00
USGS/Leetown Science Center
Aquatic Ecology Laboratory
1700 Leetown Road
Kearneysville, West Virginia 25430
(304) 724-4450

Description of Collaboration/Community Based Support:

Field and Morphological Data Collection :
State University of New York at Buffalo
Department of Biological Science
Buffalo, NY 14620
(716) 645-2898

University of College at Buffalo
1300 Elmwood Ave
Buffalo, New York 14222
(716) 838-4329

Laboratory data collection and analysis:
USGS/Leetown Science Center
1700 Leetown Road
Kearneysville, West Virginia 25430
(304) 724-4450